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| 10/587,029 | 07/24/2006 | Masahiro Orita | Q96124 | 9255 |

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| EXAMINER | |
|---|---|
| GREEN, TRACIE Y | |
| ART UNIT | PAPER NUMBER |
| 2879 | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/587,029 | ORITA ET AL. | |
| | Examiner | Art Unit | |
| | Tracie Green | 2879 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *30 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/30/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### Response to Amendment

1. Receipt is acknowledged of applicant's amendment filed 01/30/2009. Claims 1-13 are pending and an action on the merits is as follows.

2. No amendments to claims, New grounds of rejection for claim 11 only. Action is non-final.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 4, and 8-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Andriessen (US 2002/0151094 A1).

**Regarding claim 1,** Andriessen teaches quantum (Figures 1A -1E) (dot-dispersed light emitting device comprising: a substrate (21); an electron injection electrode (24);a hole injection electrode (21); and an inorganic light emitting layer (23) (Paragraph 59, lines 6-

9) *(Examiner note: prior art reference teaches this as a luminescent layer)* disposed so as to be in contact with both the electrodes (21, 24) ,wherein the inorganic light emitting layer (23) includes an ambipolar inorganic semiconductor material (Paragraph 47) and nanocrystals (*Examiner note: prior art recites "nanoparticles")* dispersed as luminescent centers (Paragraph 58) in the ambipolar inorganic semiconductor material (Paragraph 66), and is configured without having, at the interface with the electron injection electrode and/or the hole injection electrode, epitaxial relation therewith (Paragraph 47 and 48).

**Regarding claim 4,** Andriessen teaches wherein the inorganic light emitting layer comprises a ZnS type semiconductor phase (Paragraph 47 and 57)

**Regarding claim 8,** Andriessen teaches wherein the substrate (21) is a glass substrate (Paragraph 90, lines 10-12).

**Regarding claim 9,** Andriessen teaches wherein the electron injection electrode (24) and the hole injection electrode (21) are disposed spaced apart from each other, with the inorganic light emitting layer (23) Interposed there between, in a lamination on the substrate.

### *Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andriessen (US 2002/0151094 A1) in view of Danek et al. ("Electrospray Organometallic vapor deposition- A novel technique for preparation of Quantum Dot composites").

**Regarding claims 2-3,** Andriessen teaches the light emitting device set forth above (see rejection claim 1). Andriessen is silent regarding wherein the ambipolar inorganic semiconductor material is an amorphous semiconductor phase or a polycrystal semiconductor phase.

In the same field of endeavor of semiconductor light-emitting devices, Danek et al. teaches wherein the ambipolar inorganic semiconductor material is an amorphous semiconductor phase or a polycrystal semiconductor phase (Abstract, lines 4-7) in order to provide a device with improved emission and light efficiency.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the light-emitting device of Andriessen wherein the ambipolar inorganic semiconductor material is an amorphous semiconductor phase or a polycrystal semiconductor phase (Abstract, lines 4-7) in order to provide a device with improved emission and light efficiency as taught by Danek et al.

7. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andriessen (US 2002/0151094 A1) in view Mensz (US 5,422,902)

**Regarding claims 5 and 7,** Andriessen teaches the light emitting device set forth above (see rejection claim 1). Andriessen is silent regarding wherein the inorganic

light emitting layer (claim 4) or the hole injection electrode (claim 7) comprises $Zn_pM_{1-p}S_xSe_yTe_{1-x-y}$ (where $0 \leq x, y, x+y \leq 1, 0<p\leq 1$, M: alkaline-earth metal, Cd).

In the same field of endeavor of semiconductor light-emitting devices, Mensz teaches wherein the inorganic light emitting layer (Column 3, lines 1-5) $Zn_pM_{1-p}S_xSe_yTe_{1-x-y}$ (where $0 \leq x, y, x+y \leq 1, 0<p\leq 1$, M: alkaline-earth metal, Cd) in order to provide a device with decreased operating voltage and allowing for the use of a thinner cladding layer. Mensz does not explicitly teach the hole injection electrode comprises $Zn_pM_{1-p}S_xSe_yTe_{1-x-y}$ (where $0 \leq x, y, x+y \leq 1, 0<p\leq 1$, M: alkaline-earth metal, Cd).

However, one of ordinary skill in the art at the time of the invention could modify the light emitting device of Andriessen wherein the inorganic light emitting layer or the hole injection electrode comprises $Zn_pM_{1-p}S_xSe_yTe_{1-x-y}$ (where $0 \leq x, y, x+y \leq 1, 0<p\leq 1$, M: alkaline-earth metal, Cd) as taught by Mensz; wherein the inorganic light emitting layer or the hole injection electrode comprises $Zn_pM_{1-p}S_xSe_yTe_{1-x-y}$ (where $0 \leq x, y, x+y \leq 1, 0<p\leq 1$, M: alkaline-earth metal, Cd) in order to provide a device with decreased operating voltage and allowing for the use of a thinner cladding layer as taught by Mensz.

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Andriessen (US 2002/0151094 A1) in view Bulovic et al. (US 2004/0023010 A1).

Andriessen teaches the light emitting device set forth above (see rejection claim 1). Andriessen is silent regarding wherein the nanocrystals contain any of InP, GaAs, and GaP as a main component.

In the same field of endeavor of light emitting devices, Bulovic et al. teaches wherein the nanocrystals contain any of InP, GaAs, and GaP as a main component. (Paragraph 33, lines 5-8) in order to provide a device with zero-dimensional semiconductor structures show strong quantum confinement effects that can be harnessed in designing bottom-up chemical approaches to create complex heterostructures with electronic and optical properties that are tunable with the size of the nanocrystals (Paragraph 7, lines 1-6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the light-emitting device of Andriessen wherein the nanocrystals contain any of InP, GaAs, and GaP as a main component in order to provide a device with zero-dimensional semiconductor structures show strong quantum confinement effects that can be harnessed in designing bottom-up chemical approaches to create complex heterostructures with electronic and optical properties that are tunable with the size of the nanocrystals as taught by Bulovic.

9. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Andriessen (US 2002/0151094 A1) in view Hayashi et al. (US 2002/0167280 A1).

Andriessen teaches the light emitting device set forth above (see rejection claim 1). Andriessen is silent regarding wherein the electron injection electrode and the hole injection electrode are disposed spaced apart from each other in a plane on the substrate.

In the same field of endeavor of light emitting devices, Hayashi et al. (Figure 15, 16) teaches wherein the electron injection electrode (5a) and the hole injection

electrode (5b) are disposed spaced apart from each other in a plane on the substrate in order to provide of a device wherein improving reliability of hole and electron injection, the luminance of a light-emitting device, and a light-emitting display can be improved.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the light-emitting device of Andriessen wherein the electron injection electrode and the hole injection electrode are disposed spaced apart from each other in a plane on the substrate in order to provide of a device wherein improving reliability of hole and electron injection, the luminance of a light-emitting device, and a light-emitting display can be improved as taught by Hayashi et al.

10. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Andriessen (US 2002/0151094 A1) in view Koyama et al. (US 2003/0094897 A1).

Andriessen teaches the light emitting device set forth above (see rejection claim 1). Andriessen is silent regarding wherein a gate electrode is disposed between the electron injection electrode and the hole injection electrode.

In the same field of endeavor of light emitting devices, Koyama et al. teaches (Figure 6) wherein a gate electrode (70) is disposed between the electron injection electrode (20) and the hole injection electrode (40) in order to provide a device where emitted light can be obtained with high efficiency and with high directionability by selectively controlling the drive voltage (Paragraph 28)

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the light-emitting device of Andriessen wherein a gate electrode is disposed between the electron injection electrode and the hole injection electrode in

order to provide a device where emitted light can be obtained with high efficiency and with high directionability by selectively controlling the drive voltage as taught by Koyama et al.

11. Claim12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andriessen (US 2002/0151094 A1)

**Regarding claims 12 and 13,** Adriessen teaches the light emitting device set forth above. Adriessen does not explicitly teach display apparatus or illumination comprising the quantum dot-dispersed light emitting device. However one of ordinary skill in the lot could utilize the device of Andriessen in a display device or illumination device in order to provide a lamp with lower driving voltage and more durability.

### *Response to Arguments*

12. Applicant's arguments with respect to claim 11 have been considered but are moot in view of the new ground(s) of rejection.

13. Applicant's arguments filed 01/30/2009 have been fully considered but they are not persuasive. Specifically, the applicant argues that the layer 23 of Andriessen is not “an inorganic light-emitting layer” but rather doped ZnS in a binder. Examiner draws applicant’s attention to paragraph 57, in which prior art reference recites 23 as a "luminescent layer". So examiner believes applicant erred in assuming that 23 was not a luminescent layer. Secondly the applicant argues that nanocrystals are not dispersed as luminescent centers in light-emitting layer 23.

Examiner respectfully disagrees, the prior art reference sites in paragraphs 46, 98 and the "background" of Andriessen, Andriessen is clearly drawn to producing an inorganic light emitting diode by improving upon methods disclosed in the Background of the invention (Paragraphs 1-23). Paragraph 46 and 98 disclose that nanoparticles are within layer 23 which is a luminescent layer. Examiner fails to understand how nanocrystal differs from nanoparticle as no distinction was made known in the applicant's original disclosure. Thus, the rejections of claims 1-10 and 12-13 remain unchanged with more paragraphs cited for applicant .

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracie Green whose telephone number is (571)270-3104. The examiner can normally be reached on Mon-Thurs 7:00am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

/Tracie Green/
Examiner, Art Unit 2879

/Sikha Roy/
Primary Examiner, Art Unit 2879